REMARKS

Claims 1-4 are pending and remain for consideration. Claims 1-3 are amended herein.

Claims 1-4 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 1 and 2 of copending Application No. 10/357,023 (hereinafter "the '023 application"). The rejection is traversed and reconsideration is respectfully requested.

Claim 1 of the present application reads:

Method for determining optimum bond parameters including a bond force F_B and an ultrasonic variable P_B of a wire bonder for a bond process, whereby for this determination a number of bond cycles are carried out, whereby for each bond cycle a wire connection is made between a connection point of a semiconductor chip and a connection point of a substrate in that a wire end protruding out of a capillary is melted into a ball and then, in a bond position, the wire ball is attached to the connection point of the semiconductor chip, then the wire is pulled through to the required length, formed into a wire loop and attached to the connection point of the substrate, and whereby the bond parameters to be optimized are each varied in discrete steps within a predefined range, <u>wherein with each bond cycle n, **after attaching the wire ball** to the connection point of the semiconductor chip</u>, the following steps are carried out:

a) applying a predetermined bond force F_{B1},
b) moving the capillary out of the bond position in a predetermined direction whereby the current $I_n(t)$ flowing through the drive which moves the capillary is monitored in the course of time t,
c) stopping the capillary as soon as the current $I_n(t)$ decreases,

d) determining a maximum of the current $I_{n,max}$ from the progression of the current $I_n(t)$ established during steps b) and c),

and wherein from the values $I_{n,max}$ established with the n bonding processes those values for the bond parameters are determined as optimum bond parameters for which the current $I_{n,max}$ reaches a maximum.

Applicants maintain that the features upon which applicants rely (i.e., first making a wire connection, then after attachment measuring the strength of the bond connection using the capillary as a shear tool) are recited in the rejected claims.

Claim 1 recites that

- a number of bond cycles are carried out,
- that during each bond cycle a wire connection between the semiconductor chip and the substrate is made,
- that in such a bond cycle the wire is first attached to the semiconductor chip and then to the substrate.

Such a bond cycle is illustrated in FIGS. 1A to 1E.

Claim 1 further recites that

- after attaching the wire ball to the connection point of the semiconductor chip, steps a) to d) are performed.

Section [0039] of the published present application states that "... *the shear strength of selected bond connections is tested immediately after they have been made in* *__that the capillary is used in order to shear off the bond connection__*...". Steps a) to c) (illustrated in FIGS. 2A to 2D and described in section [0072] of the published present application) explicitly explain and define how this is done, i.e. how the capillary is used to shear off the bond connection. Namely in step b) the capillary is moved out of the bonding position. The wire is attached to the semiconductor chip, and the

capillary which presses with a predetermined bond force against the wire ball is moved away. The moving of the capillary is finished as soon as the current flowing through the drive which moves the capillary decreases, i.e. when the ball is sheared off.

Claim 1 does not use the exact wording *"that the capillary is used in order to shear off the bond connection"*, but rather uses an equivalent and more detailed wording for describing this function. There is no need to read the limitation *"that the capillary is used in order to shear off the bond connection"* from the specification into the claim because claim 1 already contains this limitation as explained above.

The '023 application discloses and claims a method for determining optimum bond parameters for bonding with a wire bonder. The method of claim 1 comprises the following steps:

a) carrying out several bonding operations, with which an end of a wire formed into a ball is bonded onto a connection point, whereby the bond force F_B and the ultrasonic variable P are each varied in discrete steps in a predefined range, whereby during bonding, for each bonding operation an electrical signal is produced by means of a sensor which signal is proportional to a shear force exerted on the corresponding connection point,
b) for each bonding operation, determining a quantity G from the electrical signal delivered by the sensor during the bonding operation,
c) determining a maximum value of the quantity G and corresponding values for the bond force F_B, the ultrasonic variable P or determining a global maximum of the quantity G and determining corresponding values for the bond force F_B, the ultrasonic variable P or determining a range H for the quantity G in which the

quantity G fullfils predefined criteria and determining a value for each of bond force F_B, ultrasonic variable P which lie in the range H.

The two methods are distinct for the following reason:

With the method of the '023 application, the quantity G is determined from the signal of the sensor delivered <u>during</u> the bonding operation, i.e. <u>during attaching</u> the wire ball to the connection point of the semiconductor chip. The quantity G is used as an indicator for the strength of the bond connection.

With the method of the present application as recited in amended claims 1-4, first the wire connection is made and then in a subsequent second step - <u>after</u> attaching the wire ball to the connection point of the semiconductor chip - the strength of the bond connection is measured using the capillary as a shear tool.

Consequently, the steps a), b) and c) of the '023 method and the steps a), b), c) and d) of the method recited in claim 1 of the present application are completely different as the '023 method recites a sequence of method steps to be performed <u>during</u> the bonding process whereas claim 1 of the present application recites a sequence of method steps to be performed <u>after</u> the bonding process. The same considerations set forth for claim 1 of the present application also apply to independent claim 2 of the present application for distinguishing over claims 1 and 2 of the copending '023 application.

In claim 3 of the present application, a bond connection is made that has not the final strength because at least one of the used bond parameters F_2, P_2, G_2 is less than the corresponding value F_1, P_1, G_1, but the wire is attached to the semiconductor chip or substrate, respectively. (Claim 4 which depends on claim 3 recites the value P_2 being less than that of P_1). Then the strength of the bond connection is

determined using the capillary in order to shear off the bond connection, and then the bond connection is remade with the values F_1, P_1, G_1 of the bond parameters. Again the use of the capillary to shear off the bond connection is described in steps a) to c) so as to be distinguishable over claims 1 and 2 of the '023 application, as was already explained above with respect to claims 1 and 2 of the present application. Therefore, the provisional obviousness-type double patenting rejection of claims 1-4 is improper and should be withdrawn.

In view of the foregoing, it is respectfully submitted that claims 1-4 are in condition for allowance. All issues raised by the Examiner having been addressed, an early action to that effect is earnestly solicited.

No fees or deficiencies in fees are believed to be owed. However, authorization is hereby given to charge our Deposit Account No. 13-0235 in the event any such fees are owed.

Respectfully submitted,

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